REMARKS

It is respectfully requested that application be reconsidered, in view of the arguments presented herein.

I. STATUS OF THE CLAIMS

Claims 1-38 are pending in this application. Claims 8-38 have been withdrawn from consideration due to a Restriction Requirement.

II. 35 U.S.C. 103(a) REJECTIONS

A. The Examiner rejected claims 1-3 and 5-7 under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 6,295,167 to Uematsu et al. ("the Uematsu patent").

In response, it is respectfully asserted that the Uematsu patent fails to teach or suggest the thermochromic composition recited in claim 1 of the presently claimed invention.

The Uematsu patent relates to an optical device which utilizes an optical material. In Uematsu, the optical material includes a polymer gel whose volume is reversibly changed (swelling and contraction) by absorbing or releasing a liquid in response to an external stimulus and a light scattering member covering at least a part of the surface of the polymer gel. In certain embodiments, a coloring matter may be added to the polymer gel.

However, the Uematsu patent at the very least fails to teach or suggest using a Lewis acid as part of its composition, as required by claim 1. Moreover, it is also clear from the present application, claim 1 and the disclosure of the Uematsu patent, that the "coloring matter" element described in the Uematsu patent is not the same element as the color former recited in claim 1, and thus the Uematsu patent also fails to teach or suggest the use of a color former as part of its composition. Nonetheless, the Examiner takes the position on page 2 of the instant Office

Action that given the "disclosure of "coloring matter" in Uematsu, selection of a color precursor and its concomitant developer would have been an obvious expedient to one of ordinary skill in this art in the absence of unexpected results."

Applicants respectfully disagree with the above position by the Examiner. Specifically, it is asserted that it would not have been obvious to one skilled in the art to adapt the teaching of the Uematsu patent to include the above omitted elements recited in claim 1 because the chemical properties, reactants and results produced by the thermochromic composition of claim 1 are very distinct from those produced by the optical material described in the Uematsu patent. Further, it would have also been non-obvious to substitute the above Lewis acid and color former recited in claim 1 into the optical material in Uematsu in an attempt to arrive at the present because the results produced by the thermochromic composition of claim are unexpected from those which would be expected to be produced in the chemical art.

(i). Differences in Chemistry

First, with regard to differences in chemistry, the thermochromic composition of claim 1 exhibits quite distinct chemical properties and reaction results as compared to the optical material described in the Uematsu patent. As noted above, the Uematsu patent at the very least fails to teach or suggest two of the chemical elements, i.e. the Lewis acid and color former recited in the composition of claim 1. The omission of these two elements from Uematsu is highly significant because the lewis acid and color former are each critical elements in achieving the results of the presently claimed invention. Specifically, as is clear from claim 1 and page 14 of the present specification, the Lewis acid, color former and polymer containing material are all required to be present in the thermochromic composition of claim 1 for achieving the novel results produced by the presently claimed invention, which includes the ability of the composition to alternate between a transparent (clear)/colorless (color off) condition and a non-transparent (opaque)/colored condition, in response to the temperature applied to the composition. As will be discussed in more detail below, the Uematus patent fails to teach or suggest a composition which may alternate between a transparent/colorless state and a non-transparent colored state, as required by claim 1.

For example, as is clear from claim 1 of the presently claimed invention and the present specification (in particular, page 14 paragraph [0049] of the specification), when the composition recited in claim 1 is at a temperature below the lower critical solution temperature (LCST), the components of the polymer containing material are in a homogeneous or blended phase which results in the exclusion of the color former from reacting with the lewis acid, thereby preventing color formation (color off state). On the other hand, when the composition is at a temperature above the LCST, the components of the polymer containing material are now in a separate phase from one another, thereby allowing the color former and Lewis acid freedom to react with one another to form color (color turned on state). A more detailed discussion of how the unique chemical combination of the color former, lewis acid and polymer containing material, recited in claim 1, work in conjunction with one another to produce the novel results of the presently claimed invention is set forth below:

" *Since the opacity formed upon heating a polymer mixture or solution above the LCST can be caused by phase separation of two or more polymers with differing chemical properties, it became apparent that the formation of two very different environments could allow us to use this change to "turn on" a dye. It was reasoned that a color former when combined with a Lewis acid in the presence of an LCST mixture, the lewis acid would be complexed to the more lewis basic polymer and would be unavailable to cause formation of the colored form of a color former. It was further reasoned that once heated to the point of phase separation, enough Lewis acid and color former would be left in the less Lewis basic component to cause the formation of the colored form of the color former. "* ***(See page 14, paragraph [0049] of the present application)***

In contrast, the optical material of Uematsu patent involve distinct chemical properties and do not use a reaction to form color in its composition like those of the thermochromic composition of claim 1. As discussed, the Uematsu patent fails to teach or suggest a color former and lewis acid, as well as the specific chemical reactions between these elements required by claim 1. Moreover, besides failing to teach the same reactants for forming color, the optical material of Uematsu also produces very different results from the thermochromic composition recited in claim 1.

Specifically, in Uematsu, in embodiments when "coloring matter" such as dye or pigment particles are added to the polymer gel with light scattering members, the coloring matter will mix with the polymer gel to produce either a turbid opaque/colored material or a transparent/clear colored material. Whether, an opaque/colored material or a clear colored material will result in Uematsu is dependent upon whether the polymer gel swells (transparent/colored) or contracts (turbid/colored), in response to an external stimuli. However, Uematsu fails to teach or suggest a composition which is able to alternate between a transparent (clear)/colorless (color off) condition and a non-transparent (opaque)/colored condition (color on), in response to the temperature of the composition, as required by claim 1. Rather, in Uematsu, once the "colored matter" is added to the polymer gel in forming its optical material, the optical material will become colored and will remain colored. There is never a transition back from a colored to colorless state taught in Uematsu, regardless of the external stimuli applied to the optical material.

Therefore, due to the vast difference in chemical properties and results achieved by the composition of claim 1 in comparision to the optical material noted above, it would not have been obvious for one skilled in the art to modify the teaching of Uematsu in an attempt to arrive at the presently claimed invention. In addition, the above assertion of non-obviousness is further supported by the fact that the results achieved by the composition of claim 1 would have been unexpected to one skilled in the art.

(ii). Unexpected Results

As stated above, one skilled in the art would not have expected , that by combining a lewis acid, color former and polymer containing material that they would arrive at a thermochromatic composition as recited in claim 1, which is a (i) transparent/colorless composition in a homogeneous/phase blended state (occurring below LCST temperature) caused by the separation of the color former and Lewis acid from one another in this phase, and wherein this same composition is a (ii) non-transparent/colored composition in a phase separated state (occurring above the LCST temperature), caused by the reactive combination between the color former and Lewis acid in this phase to form color. Rather , one skilled in the art based upon the principles of chemistry, would have instead expected that the Lewis acid and color former would never have been separated from one another, regardless of what state, e.g. homogeneous or separated, the thermochromic composition was in and that the composition would be in a colored condition (color on state). In particular, the Examiner's attention is again directed to page 14, paragraph [0049] of the present specification for a better understanding as to why one skilled before the derivation of the presently claimed invention (claim 1) would not have known or expected that the color former, Lewis acid and polymer containing material recited in claim 1 would react with one another the way they do to produce the unique results of the presently claimed invention.

For the reasons set forth above, the Uematsu patent fails to teach or suggest the thermochromic composition recited in claim 1 of the presently claimed invention, and thus a withdrawal of the above rejection to this claim is therefore respectfully requested. Moreover, since claims 2, 3 and 5-7 depend from and incorporate all of the limitations of independent claim 1, withdrawal of the above rejection to these dependent claims is also respectfully requested.

B. The Examiner also rejected claim 4 under 35 U.S.C 103(a) as being unpatentable over the Uematsu patent in view of U.S. Patent No. 4,860,273 to Sawano et al. ("the Sawano patent").

In response, it is respectfully asserted that the above combination of Uematsu and Sawano fails to teach or suggest the thermochromic composition of claim 4.

In particular, since claim 4 depends from and incorporates all of the limitations of claim 1, this dependent claim is likewise patentable over the Uematsu patent for at least the same reasons mentioned above for claim 1.

Moreover, the Sawano patent fails to cure the above deficiencies of the Uematsu patent. While the Sawano patent describes a polymer containing material, it like Uetmasu, also fails to teach or suggest lewis acids or color formers, as required by claim 4. In fact, the Sawano does not even relate to color formation. Rather, Sawano is directed to a method of recording information and an information medium for doing so, wherein the dyes used in its methods and device are light absorbing dyes used for generating heat in response to being irradiated with a laser beam to cause a phase change in a polymer blend. There is no teaching or suggestion in Sawano, however, of forming color in any of its recording medium layers.

For the reasons set forth above, the combination of Uematsu and Sawano fails to teach or suggest the thermochromic composition recited in claim 4 of the presently claimed invention, and thus a withdrawal of the above rejection to this claim is therefore respectfully requested.

III. CONCLUSION

It is believed that all pending claims as currently presented are in condition for allowance. A notice of allowance is respectfully requested.

According to currently recommended Patent Office policy, The Examiner is requested to contact the undersigned at the telephone number provided below in the event that a telephone interview will advance the prosecution of this application. An early and favorable action is earnestly solicited.

This paper is deemed to be filed within the shortened statutory period and no petition or fee for an extension of time is required. However, should the undersigned attorney be mistaken, please consider this a petition for any extension of time that may be required to maintain the pendency of this Patent Application, and charge deposit account no.: 50-1924 for any required fee deficiency.

Respectfully submitted:

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I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Commissioner for Patents, P.O. BOX 1450, Alexandria, VA 22313-1450.

12/15/04 Elaine F. Moran
Date